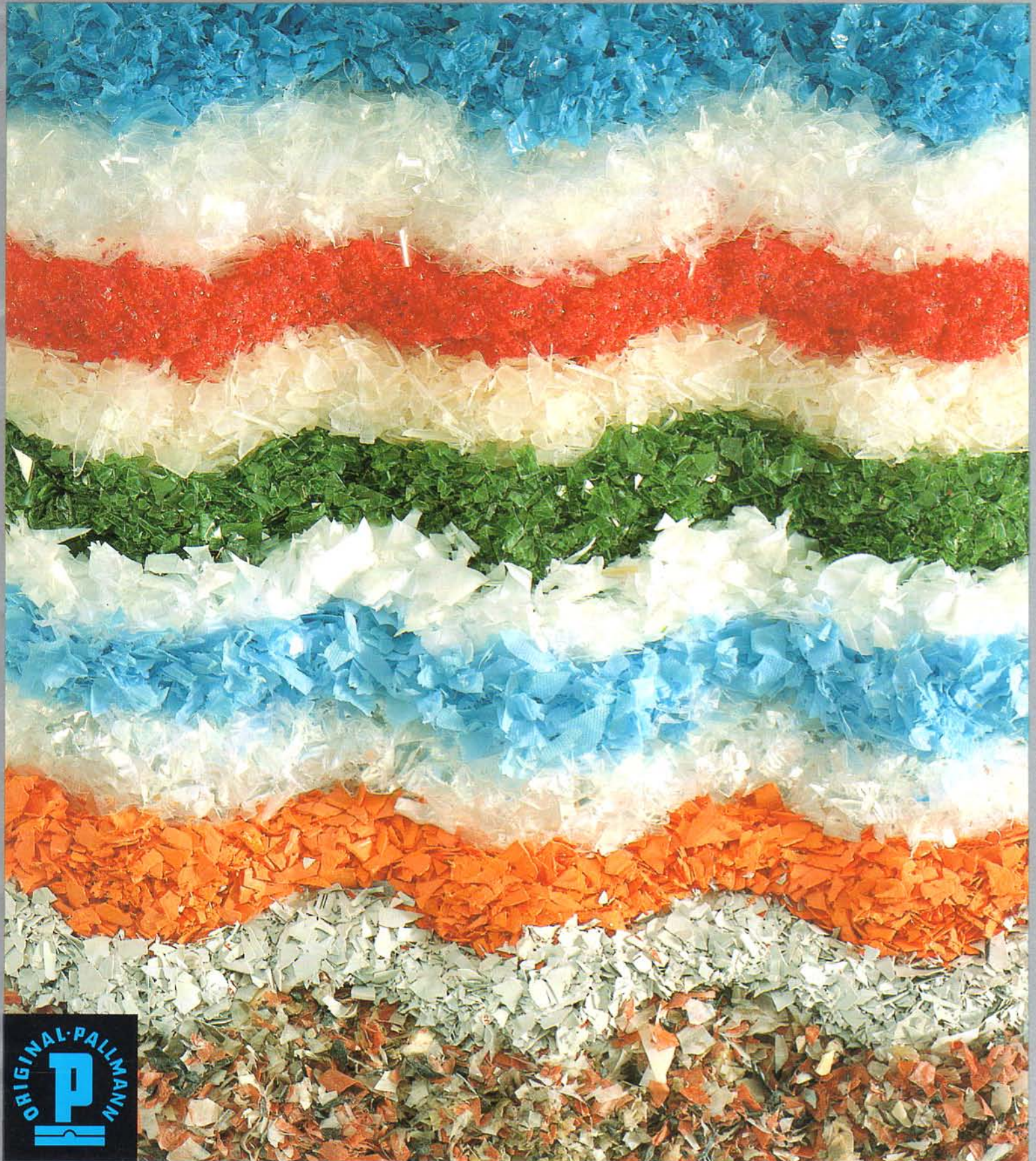


PALLMANN

Film Recycling



Profitable recycling of films.

100 % Utilization of plastics!

The optimization of production processes and the reprocessing of high quality raw materials are important targets of each film producing and processing company which cares for its future. The use of PALLMANN film recycling installations is an important contribution to the set up of a modern, profitable production facility.

Film recycling is a matter for experts. Whether you want to recycle edge trimmings, film rolls, film packs, film strips or film in bulk form, the decisive criteria for the efficiency of the used system are capacity, quality and reliability.

Thanks to decades of experience, PALLMANN has the corresponding Know-How and the technology. Whether reclaiming biaxially oriented thin films, calendered thick films or foamed films made of PP, PE, PS, polyamide, soft and rigid PVC or any other kind of films, PALLMANN has the solution for the specific application. From the single machine to complete turn-key systems, film feeding components, pneumatic and mechanical conveyors, film chip silos and microchip controlled systems, all fall within our scope of supply.

A speciality of PALLMANN is applying our technology to the individual operational requirements. Our total extensive knowledge is applied for your benefit.

To make sure that your company will meet the future demands of the market, you need efficient, reliable systems, economical machines and installations like they are offered by PALLMANN.

100 % Utilization of plastics!

This is the PALLMANN concept that enables you to run a profitable production.



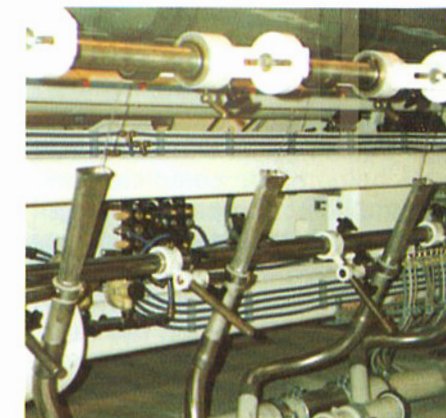
Program.



Recycling of edge trimmings.

Pull-free suction directly at the trimming line.

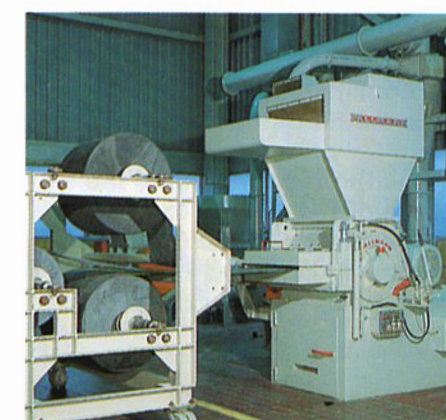
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Recycling of film rolls and bundles of film.

The infeed of the material is done automatically or by hand.

Page 6



Recycling of film waste and bulk of film.

High-capacity installations, integrated into the production lines.

Page 7



Plast Agglomerator Systems, engineering and installation of systems.

Turn-key systems from one source.

Page 8/9



Recycling of edge trimmings.

Superior systems.

PALLMANN has the know-how for pull-free suction and troublefree size reduction of all kinds of edge trimmings. This includes the right choice of the complete concept, including the proper design of the conveyor system with regard to the pick-up point, pipe guide, design of the pipe bends and of the air separator. The following illustration schematics show the basic layout of the different systems.

Illustration 1:

The continuous trimmings are fed via separate pipes from the place where they are generated. The pull-free conveying to the air separator (fig. B) and to the PALLMANN knife mill (fig. C) with in-line film silo takes place via injector and high-pressure blower (fig. A).

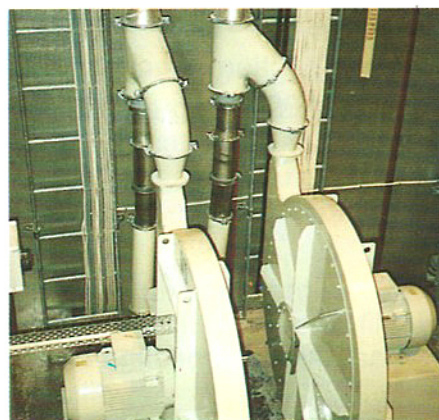
Illustration 2:

If there are also center strips in addition to the side trimmings, the system can be designed according to illustration no. 2. The continuous strips are fed through separate intakes. The suction nozzles for the center strips are adjustable.

According to the individual routing and the required total conveying length, one or more injectors with high-pressure blowers are employed. The strips are fed into the knife mill via an air separator. Where it is necessary, the film flakes are densified to free-flowing granules by a PALLMANN Plast Agglomerator.

Tandem operation.

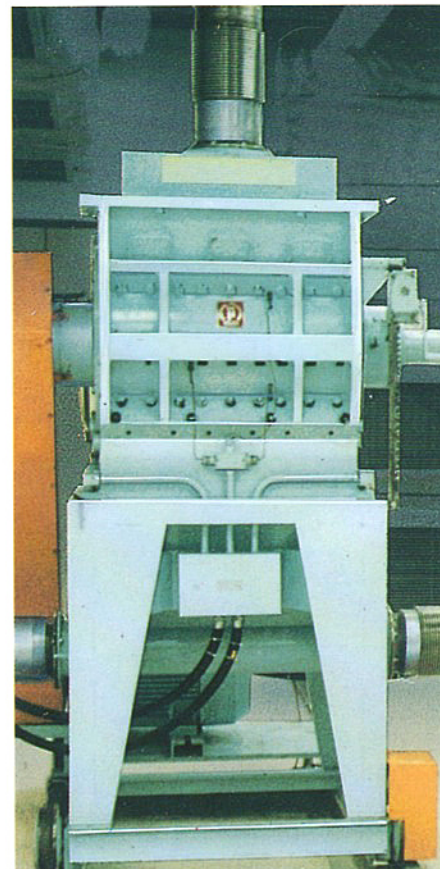
In high-production plants a parallel feed system with the corresponding knife mill is employed. Down-time is eliminated by switching over to the second system for knife changes and/or maintenance. This arrangement ensures continuation of high-capacity production.



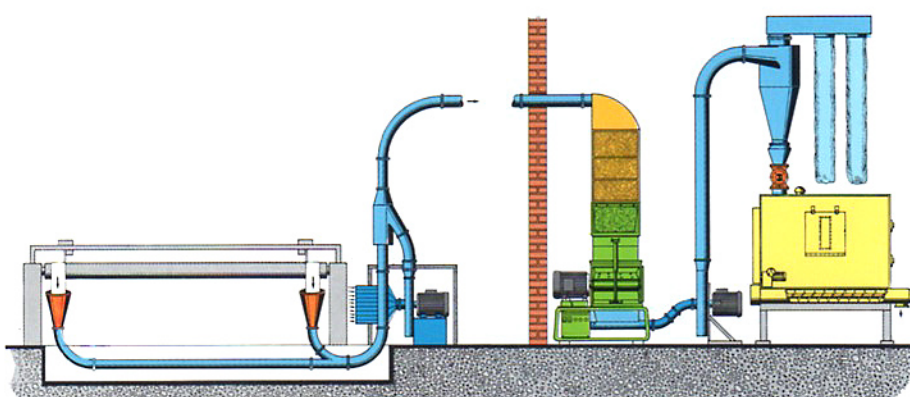
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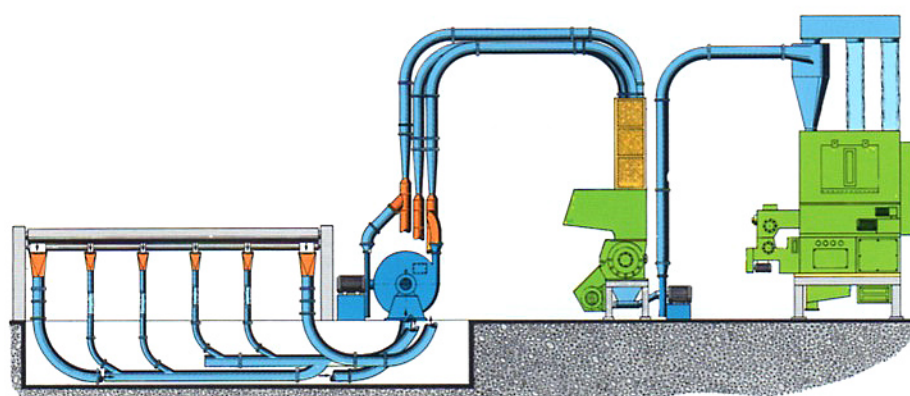
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C



1



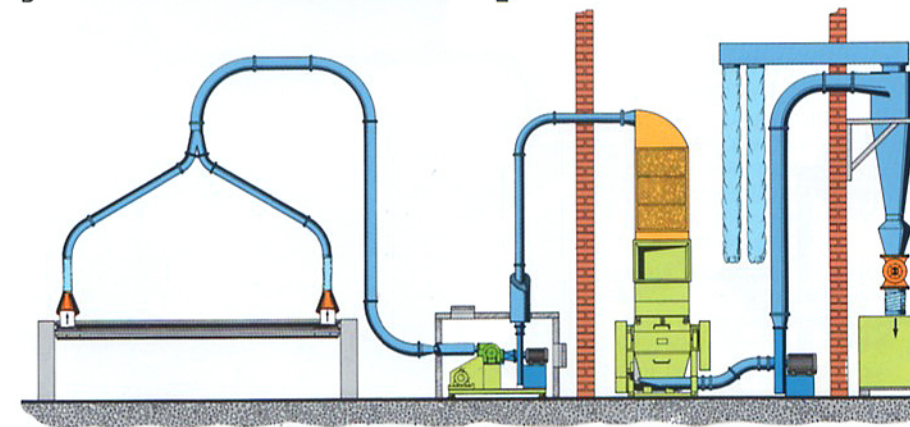
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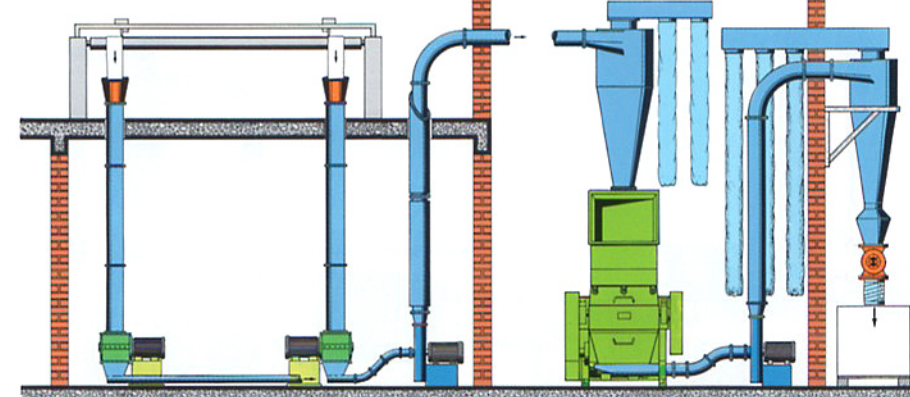
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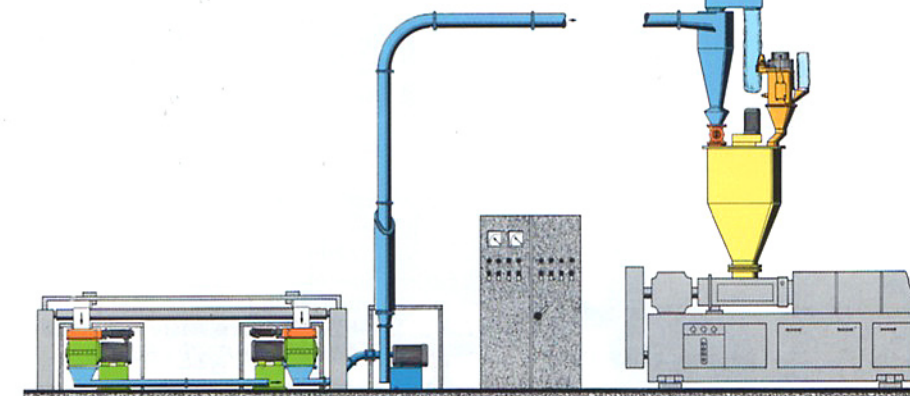
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3



4



5

Outstanding technology.

PALLMANN offers one- and two-step systems with edge trim cutters and film granulators for thicker, stiff and wide trimmings. Low pressure blowers with special impellers are employed for conveying. Separation of film flakes before the second step of size reduction takes place in an air separator or special cyclone.

Illustration 3:

Continuous strips are fed through separate intake nozzles and directed to an edge trim cutter. Here, cutting to length is determined by speed of feeding and rotor speed. When operating the film plant with high speed and with thicker edge trimmings, a separate edge trim cutter is employed for each continuous strip. Size reduction to the desired flake size is done in a downstream film granulator.

Illustration 4:

This schematic shows the two-step preparation of edge trimmings. Preliminary size reduction is done by two knife mills with open rotors and a screen with large openings. Conveying is done via a low-pressure blower. Final size reduction of the pre-cut film as well as film packages and film scrap to the desired flake size is accomplished by a film granulator.

Illustration 5:

Thick edge trimmings are fed into the granulator directly at the location where they are generated. The infeed speed is synchronized with the film line speed. This is done by direct current motor with automatic sequence control or by a threephase current gear motor with frequency converter or mechanically adjustable gear box. The strips are reduced directly to the desired flake size.

Recycling of film rolls, film packages and bulk films.

The performance you look for.

PALLMANN offers production proven standard machines and individual plant layouts in all sizes for the recycling of film rolls, film packages and bulk films.

Special knife mills for horizontal or vertical film infeed, arrangements with slanted or horizontal conveyor belts, with and without metal detectors are available to meet the local conditions.

Infeed chutes for manual infeed of film packages with additional air separator for continuous infeed of edge trimmings are ready for delivery, as well as mobile machine stands and pneumatic systems.

The following illustrations and schematics show layout possibilities.

Sound-insulation.

PALLMANN offers also for these requirements proven solutions. We will work them out with you according to your specific conditions on site. The sound-insulation is achieved by means of suction silencers, pipe silencers, sound-insulated pipings, sound-insulated cabins for high-capacity fans, air separators and knife mill systems.

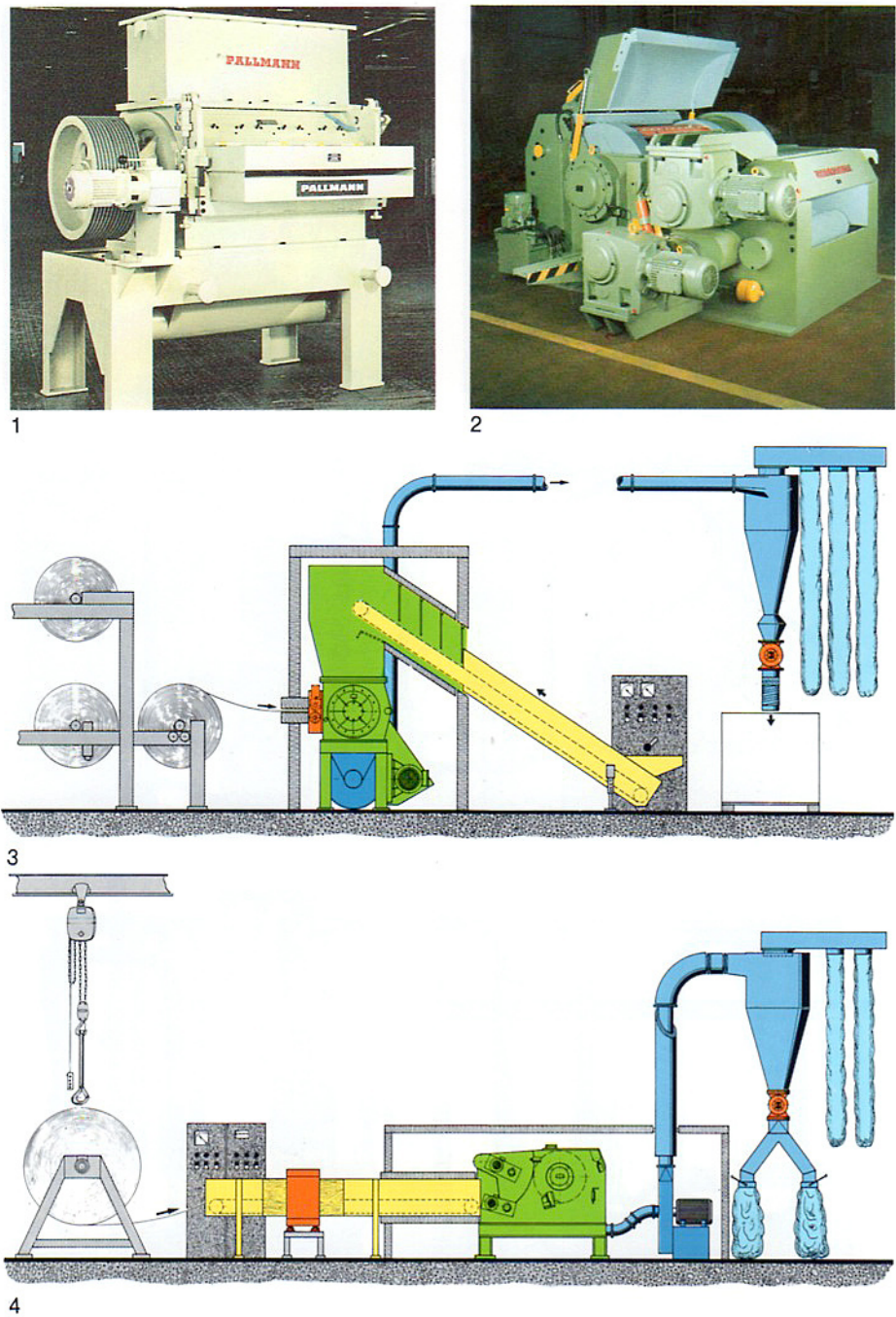


Fig. 1: Knife Mill model PS 5-10 with integrated, horizontal infeed arrangement for PVC calendar film.

Fig. 2: Knife Mill model PHK 220 x 1000 with integrated, horizontal infeed arrangement for glass-fiber reinforced polyamide films.

Fig. 3: Schematic illustration of a Knife Mill model PS 4-10 for polystyrene foamed film waste.

Fig. 4: Schematic illustration of a recycling system for glass-fiber reinforced PVC film waste with Knife Mill model PHK 120 x 650.

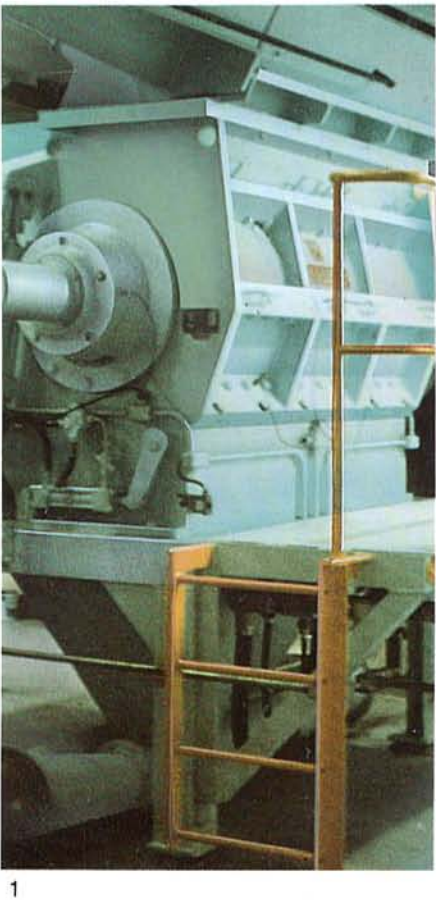
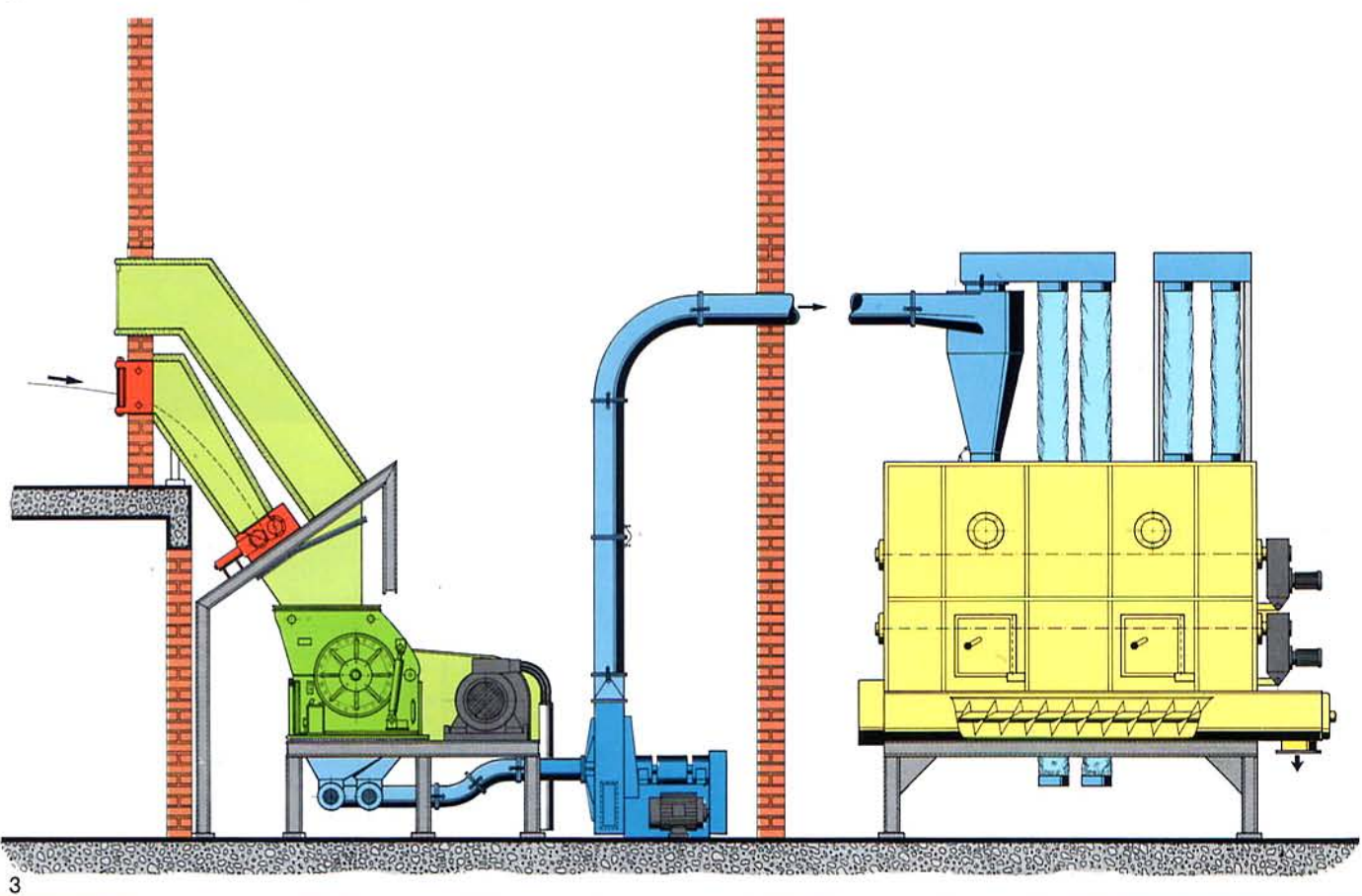


Fig. 1: Knife Mill system with model PS 8-15 for the direct recycling of polyester film waste.

Fig. 2: Draw-in roller system, model PEV 130 x 1500 with knurled, hardened and ground roller surface, one roller to be pneumatically clamped and opened, gear motor with direct current drive.

Fig. 3: Schematic illustration of a system for the recycling of biaxially oriented polypropylene film and bulk film with Knife Mill model PS 8-12 and film flake silo model PFSI 250 x 3900 M 30.



Production proven concepts.

Waste generated during start-up and adjustment of the film line must be handled where it is generated. PALLMANN, the specialist, offers production proven solutions.

PALLMANN systems are designed for the size reduction of film trimmings, coming directly from the film line, as well as for the infeed of film packages and bulk films.

An electronic control system allows a fast intake of the film trimmings up to a speed of 350 m/min. and an automatic synchronizing of the discharge speed with the speed of the film line.

Plast Agglomerator Systems.

Free-flowing granules.

Economical recycling of film waste is often achieved by densifying to free-flowing granules with high bulk density. In this regard, PALLMANN Plast Agglomerator systems have set new standards.

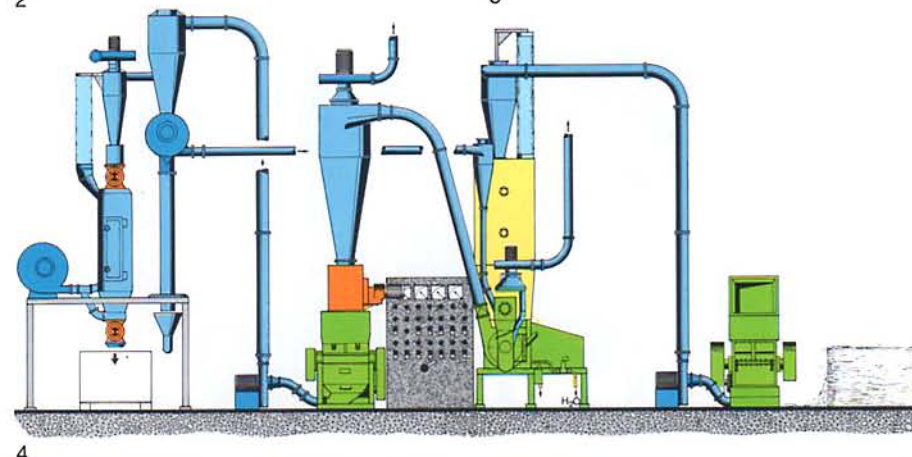
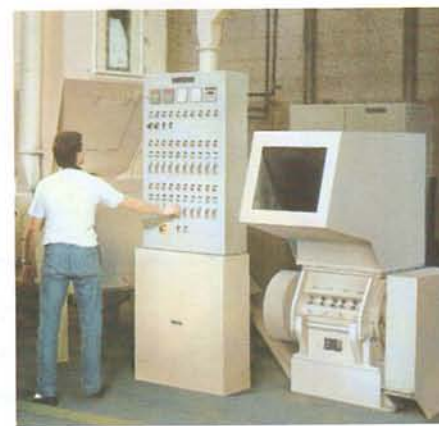
With our unique technology of gentle agglomeration by frictional heat, created between a compressor turbo and a die, the PALLMANN Plast Agglomerators produce high-quality granules with low thermal degradation.

The technological advantages are convincing:

- ☐ continuous processing
- ☐ fully-automatic operation
- ☐ extremely high throughput capacities
- ☐ best product quality
- ☐ low space requirement
- ☐ optimum economic efficiency.

PALLMANN Plast Agglomerator Systems include individual building block units, according to the specific requirements. The standard line meets the requirements of the market for a complete range of capacities.

Extensive PALLMANN know-how guarantees the manufacturers and processors of film worldwide quality and continuous production.



Engineering and manufacturing of complete installations.

Turn-key systems.

PALLMANN successfully builds recycling systems, from basic layout to start-up. Productivity and safe production are achieved by the choice of the right machines and attention paid to the details.

Whether hydraulic guillotines for cutting of film bales and rolls, conveying systems with or without metal detector, conveying and dosing screws, film flake silos or dosing silo for film flakes, PALLMANN offers for each problem the most efficient and perfect solution.

The success of the PALLMANN installations is based principally on technological competence, capable and most modern mechanical engineering, intensive development efforts and close cooperation with our customers. These are the reasons, why the leading film manufacturing and processing companies buy equipments from PALLMANN.

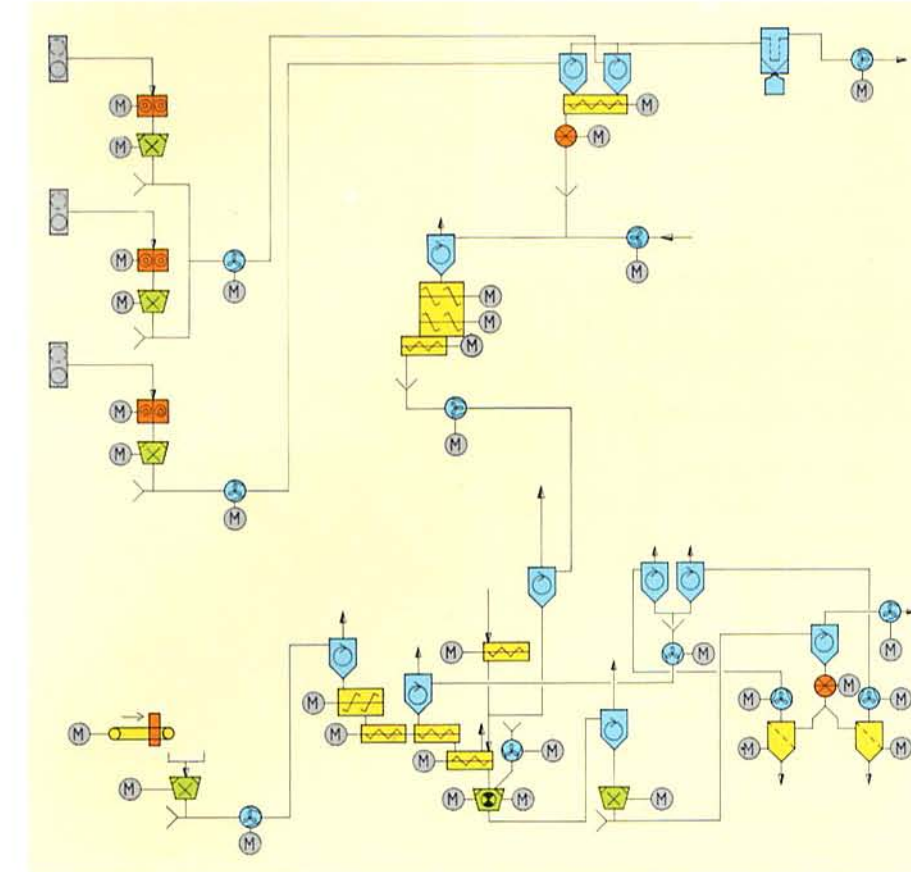


Fig. 1: Plast Agglomerator System model PFV 200 for polypropylene film.

Fig. 2: Plast Agglomerator System model PFV 250/40, Hot Melt Granulator model PS 400 x 500 and granules cooler.

Fig. 3: Plast Agglomerator System model PFV 250 for polyamide films.

Fig. 4: Schematic illustration of a Plast Agglomerator System model PFV 250/40 for polyester film.

Fig. 5: Flow sheet of a recycling installation for soft PVC film waste.

Fig. 6: Hydraulic Guillotine model PBS 1500 x 1500 for film bales.

Fig. 7: Film flake silo type PFSI 250 x 3900 M 40 for storage of approx. 40 m³ of film flakes.

Top in quality, capacity and reliability.

Know-how and advantages in each detail.

Recycling of films makes highest demands on knife mills. The three-shift operation as well as the high cutting forces occurring when reducing films require optimized designs with regard to the precision of manufacturing, the mechanical strength, the throughput capacity and the ease of maintenance. Also here PALLMANN machines are setting standards.

Proven slant-cut rotors (fig. 1).

For the size reduction of films, Pallmann has developed the slant-cut rotors with standardized short knives. The knife edges are in staggered arrangement. There is always only one knife cutting at the same time. This offers the following advantages in operation:

- ☐ shock-reduced cutting, smooth running and consequently low noise pollution
- ☐ optimum utilization rate, low specific power consumption
- ☐ less temperature increase even at full load in continuous operation, no water cooling of rotor or housing necessary
- ☐ optimum cutting angle and free angle for longest service life of the knives.

Exact grinding gap setting (fig. 2).

PALLMANN uses often regrindable knives. The setting of the rotor- and stator knives is done outside of the machine in special setting gauges. So no time is wasted for setting the knife gap in the machine. The assets for practical operation are evident:

- ☐ precise gap setting for exact cutting, even of finest films
- ☐ clean cut flakes of high bulk density
- ☐ quick and simple knife change and consequently reduced down times and increased operation time
- ☐ once set, the cutting circle remains constant and, as a consequence, the preset gap to the screen remains also constant.

Precise special bearings (fig. 3).

PALLMANN Knife Mills for the recycling of films are designed with precise bearings with double sealing. Contact free sealing of the grinding chamber, where the shaft enters the grinding chamber, is done by means of compressed air purging where necessary. This means:

- ☐ no penetration of grease into the grinding chamber
- ☐ no penetration of ground material in the bearings
- ☐ optimum smooth running of the machine
- ☐ low temperature in the bearings.

Optimum rotor protection (fig. 3).

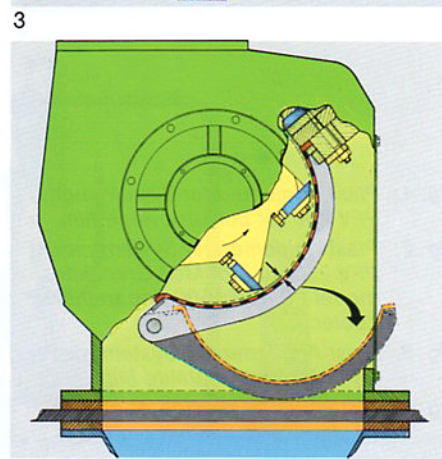
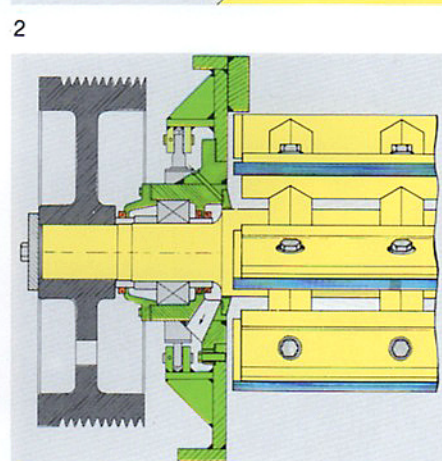
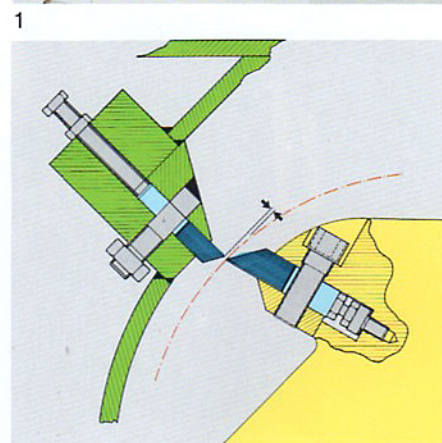
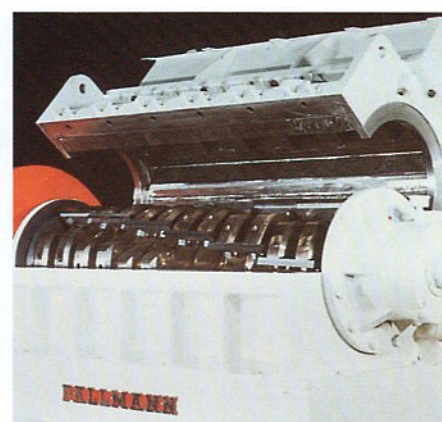
Special guiding plates have been provided in the upper part of the machine housing. The lateral grinding chamber walls are of special design:

- ☐ no winding of film around the rotor shaft
- ☐ no friction of material between housing walls and side plates of the rotor.

Variable screen inserts (fig. 4).

The screens of the PALLMANN Knife Mills can be replaced easily in shortest time. The gap between screen and knife circle can be set. The assets for the practical operation are:

- ☐ optimum adaption to the required flake quality
- ☐ simple and fast screen change
- ☐ good accessibility of the grinding chamber.



Throughput rates.

System	type	Screen	PS 3	PS 3-5	PS 3-7½	PS 3½	PS 4-5	PS 4-7½	PS 4-10	PS 4-12½
Motors	kW		4,0 - 5,5	5,5 - 15	7,5 - 18,5	11 - 22	18,5 - 45	22 - 55	37 - 75	45 - 90
Polyester film	10 µm	10 mm □ 6 mm □ 4 mm ∅	160 110 80	180 130 90	250 170 120	350 240 170	600 410 300	900 610 450	1200 820 600	1500 1020 750
Polyester film	300 µm	10 mm □ 6 mm □ 4 mm ∅	210 140 100	230 160 110	310 210 140	440 300 210	750 510 370	1120 760 550	1500 1020 740	1870 1270 920
PP film	30 µm	10 mm □ 6 mm □ 4 mm ∅	180 110 70	200 130 80	270 160 110	380 230 150	660 400 270	990 600 400	1320 800 540	1650 1000 670
PP film	300 µm	10 mm □ 6 mm □ 4 mm ∅	200 120 80	230 130 90	310 180 120	440 270 180	760 460 310	1140 690 460	1520 920 620	1900 1150 770
PE film	50 µm	10 mm □ 6 mm □ 4 mm ∅	160 110 70	180 120 80	240 160 110	350 240 160	600 410 280	900 600 420	1200 820 560	1500 1020 700
PE film	400 µm	10 mm □ 6 mm □ 4 mm ∅	200 140 100	230 160 110	310 210 150	440 300 210	760 520 370	1140 780 550	1520 1040 740	1900 1300 920
Rigid PVC film	200 µm	10 mm □ 6 mm □ 4 mm ∅	215 130 80	250 140 100	350 180 130	490 280 180	840 490 330	1260 730 490	1680 1460 980	2100 1220 820
Rigid PVC film	200 µm	10 mm □ 6 mm □ 4 mm ∅	200 120 70	230 130 90	300 180 120	440 260 170	760 450 300	1140 670 450	1520 900 600	1900 1120 750

System	type	Screen	PS 5-7½	PS 5-10	PS 5-12½	PS 6-9	PS 6-12	PS 8-12	PS 8-18	PS 10-24
Motors	kW		45 - 75	55 - 90	75 - 110	75 - 110	90 - 160	110 - 200	160 - 300	250 - 500
Polyester film	10 µm	10 mm □ 6 mm □ 4 mm ∅	1070 730 540	1420 970 710	1780 1220 900	1620 1100 810	2160 1460 1080	2780 1900 1400	4170 2850 2100	6250 4270 3150
Polyester film	300 µm	10 mm □ 6 mm □ 4 mm ∅	1330 900 650	1770 1190 860	2220 1500 1080	2020 1370 990	2690 1820 1310	3460 2340 1690	5190 3510 2530	7780 5260 3790
PP film	30 µm	10 mm □ 6 mm □ 4 mm ∅	1180 720 480	1570 950 630	1970 1200 800	1780 1080 730	2370 1430 970	3070 1870 1250	4600 2800 1870	6900 4200 2800
PP film	300 µm	10 mm □ 6 mm □ 4 mm ∅	1350 820 550	1800 1090 730	2260 1370 920	2050 1240 830	2730 1650 1100	3510 2130 1430	5260 3190 2140	7890 4780 3210
PE film	50 µm	10 mm □ 6 mm □ 4 mm ∅	1070 720 500	1430 950 660	1790 1200 830	1620 1100 750	2150 1460 990	2780 1870 1300	4170 2800 1950	6250 4200 2920
PE film	400 µm	10 mm □ 6 mm □ 4 mm ∅	1350 930 650	1800 1230 860	2260 1550 1080	2050 1400 990	2730 1860 1310	3510 2420 1690	5260 3630 2535	7890 5440 3800
Rigid PVC film	200 µm	10 mm □ 6 mm □ 4 mm ∅	1500 870 590	2000 1160 780	2500 1450 980	2250 1330 890	3000 1770 1180	3860 2260 1540	5790 3390 2310	8680 6940 3460
Rigid PVC film	200 µm	10 mm □ 6 mm □ 4 mm ∅	1350 790 540	1800 1050 710	2260 1320 900	2050 1210 810	2730 1600 1080	3510 2060 1400	5260 3090 2100	7890 4630 3150

The throughput rate varies with the type of film (stretched or unstretched), the film thickness, the shape of the film (packages, smooth film, crumbled), the machine setting (screen openings, shape of knives, gap setting).

The throughput rates given are for guidance only and not binding. We gladly run extensive tests in our Research- and Technology-Center or in our custom processing plants to establish guaranteed rates for your production.



The Partner:

PALLMANN, the Size Reduction Specialist, offers a wide and complete program of machines and systems with outstanding technology. PALLMANN's exceptional experience and know-how have solved more different size reduction problems than most others. Thousands of machines and installations are proof for this day by day – worldwide.

If you have size reduction, pulverizing, agglomerating or air-classifying applications talk to the Specialists, send us your inquiry, or better come and see us in the world's largest Research- and Development Center for Size Reduction Techniques.

The assurance:

PALLMANN operates custom grinding plants and recycling plants in Europe, North and South America. This is where PALLMANN machines and systems are developed in 3-shift production. Custom processing from small to large quantities of your material at PALLMANN will give you the opportunity to test new markets without the high risk in investing in your own equipment right at the beginning.

The service:

The spare- and wear parts service is an essential part within the PALLMANN program.

A worldwide service guarantees fast help in case of break-down and ensures a constant supply with Original PALLMANN spare- and wear parts.

PALLMANN

The Size Reduction Specialist

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Utilization
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